

Numbers

- Counting or Natural Numbers: 1, 2, 3, 4, 5, ...
- Whole Numbers: 0, 1, 2, 3, 4, 5, ...
- Fractions or Rational Numbers: numbers that can be written as $\frac{a}{b}$, i.e. $\frac{1}{2}$, $\frac{5}{8}$, $\frac{15}{35}$.
- Proper Fractions: the number in the numerator is smaller than the number in the denominator, i.e. $\frac{4}{5}$, $\frac{1}{9}$, $\frac{13}{40}$.
- Improper Fractions: the number in the numerator is larger than the number in the denominator, i.e. $\frac{9}{7}$, $\frac{15}{2}$, $\frac{20}{19}$.
- Mixed Numbers: a whole number and a proper fraction, i.e. $1\frac{3}{5}$, $5\frac{8}{9}$.

5	$13\frac{5}{9}$	6	$\frac{8}{5}$	$\frac{30}{49}$	$\frac{2}{3}$	8	$\frac{19}{15}$	0	$21\frac{3}{16}$
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1. Which of the above (1) numbers are natural numbers?
2. Which of the above (1) numbers are whole numbers?
3. Which of the above (1) numbers are fractions?
4. Which of the above (1) numbers are proper fractions?
5. Which of the above (1) numbers are improper fractions?
6. Which of the above (1) numbers are mixed numbers?

Prime and Composite Numbers

- A natural number that has exactly two different factors, itself and 1, is called a prime number, i.e. 2, 3, 5, 7, 11, ...
- A natural number, other than 1, that is not prime is called composite, i.e. 4, 6, 8, 9, ...

5	18	6	13	25	9	36	10	13	17	4	7
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7. Which of the above (2) numbers are prime number?

8. Which of the above (2) numbers are composite?

Prime Factorizations

- To factor a composite number into a product of primes is to find a prime factorization of a number, i.e. $8 = 2 * 2 * 2$, $15 = 3 * 5$.
- Every number has just one (unique) prime factorization.

Two Ways to Find the Prime Factorization

495:

$$\begin{array}{r} 11 \\ 9 \overline{)99} \\ 5 \overline{)495} \end{array}$$

So $495 = 5 * 9 * 11$

240:

$$\begin{array}{c} 240 \\ \swarrow \quad \searrow \\ 10 \quad 24 \\ \swarrow \quad \searrow \quad \swarrow \quad \searrow \\ 2 \quad 5 \quad 4 \quad 6 \\ \quad \quad \swarrow \quad \searrow \quad \swarrow \quad \searrow \\ \quad \quad 2 \quad 2 \quad 2 \quad 3 \end{array}$$

So $240 = 2 * 2 * 2 * 2 * 3 * 5 = 2^4 * 3 * 5$

9. Find the prime factorization of 12.

10. Find the prime factorization of 140.

11. Find the prime factorization of 195.

Fractions

- The number on the top of a fraction is called the *numerator*.
- The number on the bottom of a fraction is called the *denominator*.
- $\frac{n}{n} = 1$ for any whole number n that is not 0, i.e. $\frac{8}{8} = 1$.
- $\frac{n}{1} = n$ for any whole number n that is not 0, i.e. $\frac{2}{1} = 2$.
- $\frac{0}{n} = 0$ for any whole number n that is not 0, i.e. $\frac{0}{10} = 0$.
- $\frac{n}{0}$ is not defined (does not exist) for any whole number n that is not 0, i.e. $\frac{1}{0}$ is not a real number or does not exist.

Simplify:

12. $\frac{0}{58}$

13. $\frac{9}{1}$

14. $\frac{1325}{1325}$

15. $\frac{10-10}{6598}$

16. $\frac{872}{1}$

17. $\frac{3584}{3584}$